

Target 12 and 24 : Two sessions

Session 1 Activity

This session introduces a game that uses the four arithmetic operations. The aim of this game is to use numbers in interesting and creative ways. The students write their operations in words.

VERY IMPORTANT: ON THIS DAY THEY ONLY WRITE THEIR SOLUTION IN WORDS.

1. Start by playing a simple version together with the class and then you will be able to play a harder version of the game in your groups. The teacher writes TARGET 12 in a box on the board, gives a large die to each of four selected students, and divides the class into two teams.
2. The four students all roll their dice and the teacher writes the numbers on the board.
Can anyone make 12 by combining some, or all, of these numbers? Each number can only be used once.
If no one can make 12, then the four students roll their dice again. If they can make 12, then selected students explain their methods.
For example, if 5, 4, 1, 2 are rolled, someone may correctly suggest “add 5 and 1 then multiply by 2”. Write this in words on the board.
If 4, 4, 5, 3 are thrown; someone may suggest “just multiply 4 by 3”.
Someone else may suggest “add 4, 3 and 5”. Write this in words on the board.
If a student suggests a correct way of making 12, then their team wins a point. The other team can challenge it and if the challenge is upheld then the challengers take the point instead. Teams take turns in suggesting a method. When no one can suggest another way, the dice are rolled again. Play continues until one team has reached 12 points.
3. Using some of the examples from the game, discuss how to write the ways of making 12 in mathematical notation. Stress the use of brackets for making intentions clear. For example, “add 5 and 1 then multiply by 2” has to be written as $(5 + 1) \times 2$ and not as $5 + 1 \times 2$ which could be misinterpreted as 7.
4. Groups of four or six students (each divided into two teams) now play a similar game with TARGET 24. Students write down the numbers thrown each time, along with the methods of getting 24 in words. Teacher observes students working to collect good examples for subsequent discussion.

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5. End the session with a discussion of any patterns that the students noticed (e.g. 2, 3, 4 and 6 can all be used with multiplication, because they are factors of 24)

Session 2

This session makes the transition from writing instructions in words to writing them in mathematical symbols. People need to be able to communicate exactly what calculations they have in mind. This is done by agreed rules (conventions) and by using brackets.

1. Using some of the examples from the earlier game, discuss how to write some of the students' ways of making 24 in mathematical notation. Firstly stress the use of brackets for making their intentions clear. For example, "add 5 and 1 then multiply by 4" can be clearly written as $(5 + 1) \times 4$ and not as $5 + 1 \times 4$ which could be 9.
2. Discuss and clarify other conventions as necessary.
Brackets are cleared first.
Multiplications and divisions are performed next, working in order from left to right.
Additions and subtractions are follow next, working in order from left to right.
Example: $3 + 4 \times 5 - 10 + (6 + 10)/8$
Step 1 $3 + 4 \times 5 - 10 + 16/8$
Step 2 $3 + 20 - 10 + 16/8$
Step 3 $3 + 20 - 10 + 2$
Step 4 $23 - 10 + 2$
Step 5 $13 + 2$
Step 6 **15**
Recommend the use of brackets wherever ambiguity may arise.
3. Play the game TARGET 20 in groups with four dice, this time recording the calculations in both words and mathematical symbols. Collect good examples and use them to end the session with a class discussion of the conventions.